

Exhibit 18

Arizona Republic 10/10/05

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LAW ENFORCEMENT

Arguments rage over voice-stress lie detector

By Dennis Wagner
THE ARIZONA REPUBLIC

At least 20 Arizona law enforcement agencies are relying on a voice-measuring lie detector for criminal investigations even though experts say the device does not stand up to scientific scrutiny and may prompt innocent suspects to make false confessions.

The Computer Voice Stress Analyzer, or CVSA, purportedly measures FM radio waves produced by muscles around the larynx. Deceptive answers cause stressful "micro-tremors" in the voice that are charted by the device's software program, the manufacturer says.

Yet, independent experts have consistently found the in-

See CVSA Page A14

CVSA

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strument to be dubious, at best, when it comes to separating truth from lies. And, while increasingly more police agencies are using it to interrogate suspects and assess witnesses, they don't use the machine for internal investigations or to screen recruits.

The Department of Defense Polygraph Institute concluded that CVSA produced "dismal results" and "no examiner did better than the chance level."

Two years ago, the National Academy of Sciences reviewed voice-stress studies and concluded there is "little or no scientific basis" to consider the device an alternative to polygraph machines.

And a report done for the International Association of Chiefs of Police found: "Whatever the CVSA may record, it is not stress. ... The poor validity for the current voice stress-technology should provide a caveat to agencies considering adding voice stress to their investigative toolboxes."

Despite those critiques, the company behind CVSA claims its device is more accurate than a polygraph machine, and has solved hundreds of crimes across the country.

Charles Humble, chairman and chief executive officer of the business known as National Institute for Truth Verification, said voice-stress technology helps detectives target the bad guys during investigations, and clears innocent suspects who might otherwise remain under suspicion. It also is used to check witnesses' veracity.

"We believe the system is 100 percent accurate," Humble added.

Widespread popularity

According to the institute, 1,400 American law enforcement agencies have purchased Computer Voice Stress Analyzers in recent years, at \$10,760 per machine.

The device is purportedly used in Iraq by counterintelligence forces and at the military's terrorism detection cen-

ter in Guantanamo Bay, Cuba.

In Arizona, it is employed by the state Department of Public Safety, Maricopa County Sheriff's Office and police in Mesa, Glendale, Gilbert and Avondale, to name a few. It also has been used in training programs at Fort Huachuca, the Army's intelligence training center in southern Arizona.

The institute's literature identifies research works that seem to endorse the instrument. One study found "100 percent agreement between CVSA and the polygraph." Another concluded it is "accurate when utilized as a truth verification device, and produced a confession rate of 94.8 percent."

Humble acknowledged, however, that no independent testing has demonstrated the machine's integrity. He claimed CVSA cannot be evaluated under laboratory conditions because stressful deviations occur only when an interrogation subject is afraid of prison or the death penalty.

"We never really had the funding to do that, to take it to a university and pay for all the researchers," he said.

Competes with polygraph

Peoria police Detective Tom Stewart, who has administered dozens of CVSA exams, said suspects often crack when told they are facing a foolproof deception-detector.

"I don't know if this thing works," Stewart admitted. "But it works for me in getting people to see the light. ... They deny doing it right up to the point of me asking the first question. Then they break down and say, 'You don't need to do the test. I'm guilty.'"

Before CVSA, Stewart said, police departments had to pay \$150 for private polygraph exams or wait days for state examiners to be available. With voice-stress testing, he said, getting confessions is faster, cheaper and easier.

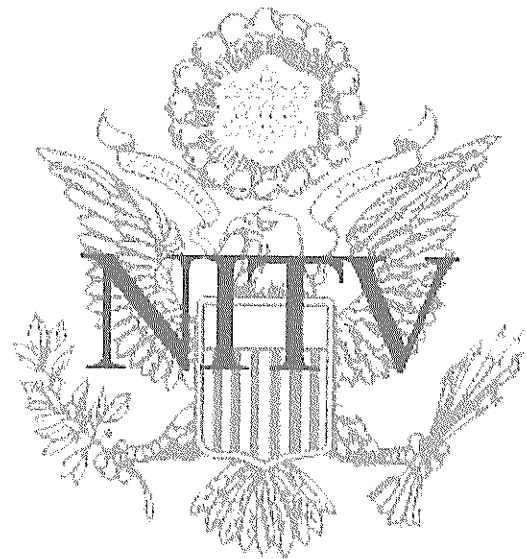
CVSA technology is based on research first conducted by the Army four decades ago. A pair of retired officers took their findings to the public in 1970

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CVSA Marketer NITV Sued for Fraud

Bianca Fletcher, a former Arkansas Department of Corrections employee who alleges that she “was fired, purportedly for being deceptive” on a Computer Voice Stress Analysis (CVSA) “test,” has filed a federal lawsuit against NITV, LLC, NITV Federal Services, LLC, their founder, Charles Humble, NITV employee Gene Shook, and two “John Does.”



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NITV Federal Services logo (misappropriating the Great Seal of the United States)

Fletcher claims damages for “libel, slander, false light, illegal exaction, negligence, and products liability, in an amount exceeding that required for diversity jurisdiction.”

Fletcher’s 6-page Complaint, filed on 18 May 2020, alleges the following general facts:

Exhibit 22

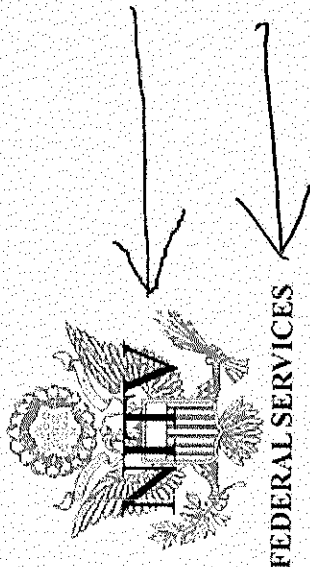
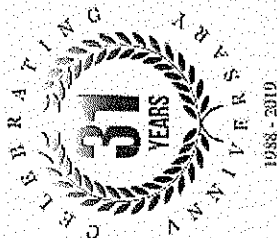
From: Arthur Herring III <admin@dektorpse.com>
Sent: Tuesday, June 11, 2019 9:12 AM
To: admin@dektorpse.com
Subject: illegal use of Great Seal

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The CVSA is sold only to law enforcement/government agencies... The CVSA is now used by over 2,500

Exhibit 22

18 U.S. Code § 713. Use of likenesses of the great seal of the United States, the seals of the President and Vice President, the seal of the United States Senate, the seal of the United States House of Representatives, and the seal of the United States Congress

U.S. Code Notes

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(a) Whoever knowingly displays any printed or other likeness of the great seal of the United States, or of the seals of the President or the Vice President of the United States, or the seal of the United States Senate, or the seal of the United States House of Representatives, or the seal of the United States Congress, or any facsimile thereof, in, or in connection with, any advertisement, poster, circular, book, pamphlet, or other publication, public meeting, play, motion picture, telecast, or other production, or on any building, monument, or stationery, for the purpose of conveying, or in a manner reasonably calculated to convey, a false impression of sponsorship or approval by the Government of the United States or by any department, agency, or instrumentality thereof, shall be fined under this title or imprisoned not more than six months, or both.











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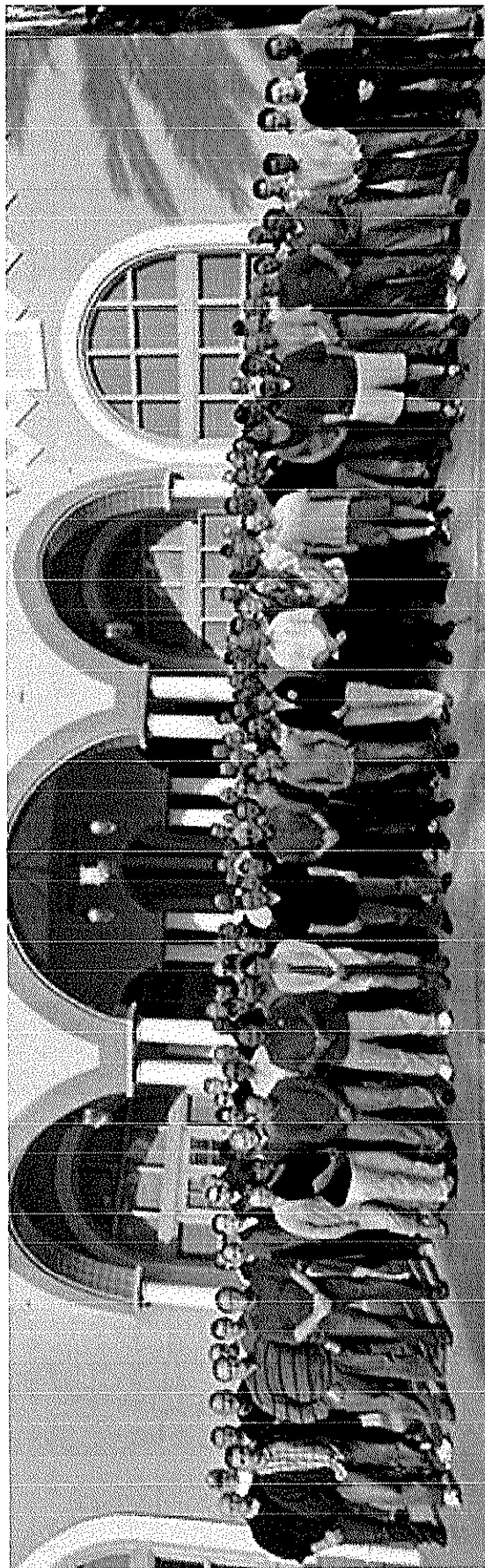


Exhibit
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Since 1988, our fulltime staff of professionals have set the standard in the truth verification industry. Our goal is to support technology and training methods that have capabilities far beyond any historical truth verification products or applications.

Professionalism and dedication define our company. Our team members have graduated from some of the nation's leading universities and come to us with distinguished careers in law enforcement, military, security, and intelligence. We consider our work all passionate about, individually and as a team. Our passion, loyalty, and commitment to excellence in the work we undertake has allowed us to form tremendous bonds and long-term relationships with our clients.

The Validity and Comparative Accuracy of Voice Stress Analysis

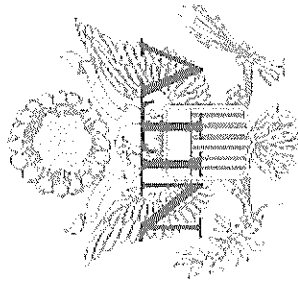
as Measured by the CVSA:
A Field Study Conducted in a Psychophysiological Context,
a federally funded study conducted by Dr. John Palmatier
in cooperation with the Michigan State Police.

SUMMARY OF RESEARCH FINDINGS

In 1988 a new device was developed and marketed, called the Computer Voice Stress Analyzer (CVSA), which has high accuracy in detecting deception, according to the manufacturer. The CVSA has since been the subject of a series of university-grade laboratory studies, none of which found this device capable of detecting either stress or deception at levels above chance. The marketers of the device point to the large body of testimonials they have gathered as evidence of efficacy, and suggest that laboratory studies are inadequate to validate the CVSA since they lack the realism needed to create the types of reactions found in real world criminal settings. In order to overcome this shortcoming, the researcher set about collecting field data to test the CVSA.

Fifty confirmed deceptive cases from criminal investigations were collected from the field, in addition to fifty confirmed truthful cases. The voice data were recorded during live law enforcement polygraph examinations with studio grade recording equipment following the CVSA manufacturer's written testing protocol. The voice recordings were then played through the CVSA, and the graphic outputs from the device were interpreted by trained CVSA examiners who did not know beforehand whether the examinees were actually truthful or deceptive.

The CVSA examiners were not able to distinguish truth tellers from deceivers at higher than chance levels in this study. Only one examiner was able to render a statistically significant result, and that was an accuracy of much less than chance with truthful examinees. Moreover, inter-examiner agreement for the CVSA examiners, though statistically significant, was quite poor. Several post hoc analyses were conducted, based on manufacturer's objections to the findings, to determine whether disappointing CVSA performance was the result of confounding experimental factors, such as the testing examiner, impedance mismatching, and scoring rules. **All analyses consistently found chance-level performance for the CVSA, regardless how the data were reanalyzed. The study conclusively demonstrated that the CVSA device and technique are not able to discriminate between truthful or deceptive statements in law enforcement settings, as predicted by the body of laboratory findings. The converging lines of evidence make a powerful case that the CVSA has no validity as a deception detection technology.**



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CVSA III NOW AVAILABLE

ANNOUNCEMENT – Due to the worldwide Coronavirus crisis, we have been advised Dell Rugged 12 notebooks are not available until further notice. The CVSA III will continue to be available, housed in the business-grade Dell Latitude 5400. For further information please **contact us**.

world... CVSA is the only scientifically validated voice stress analyzer in the world and is validated to be 98% accurate

**Reprinted from the Scientific Journal
Criminalistics and Court Expertise
2012 Annual Issue, Number 57**

Exhibit
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James L. Chapman, Professor Emeritus
Former Director of Forensic Crime Laboratory
State University of New York at Corning, NY USA

Marigo Stathis
Scientific Consultant, Research Analyst

**FIELD EVALUATION OF EFFECTIVENESS OF VSA (VOICE STRESS ANALYSIS)
TECHNOLOGY IN A US CRIMINAL JUSTICE SETTING**

This research paper represents 18-years of data evaluating the use of the VSA technology for the detection of stress associated with possible deception. Using a combinatorial approach of VSA and a standardized questioning process, an expert obtained the results of stress detection associated with criminal activities, which are proven in 95% of cases. On the other hand, there were no cases when a confession was obtained in the absence of stress. In particular, the most considerable stress levels were detected during the investigation of murder cases, grand larceny and sexual crimes. When the VSA technology was used for diagnostic purposes to predict deception, positive results were obtained in approximately 95% of the cases. Additionally, a strong, indirect relationship (approximately 94%) was discerned between jeopardy (crime consequences) and confession rates among guilty suspects.

The implications of the findings for the suitability of VSA as a deception detection tool in the field are discussed.

1. Introduction

This retrospective analysis assesses 18-years of actual criminal cases, all of which involved Voice Stress Analysis (VSA) examinations conducted by an experienced criminologist. The purpose of this analysis is to evaluate the efficacy and accuracy of VSA technology as a decision support tool

for the detection of stress associated with deception during criminal investigations.

It is known that the encoding of physical stress in the human voice is highly influenced by an increase in respiration, which heightens the sub-glottal pressure during phonation. The distance of speech between breaths is diminished, while the articulation rate is affected. Stress changes the larynx muscle activity and vocal folds, which subsequently modifies the air velocity through glottis and sound frequency (i.e., as vocal folds increase in tension, the frequency increases). Stress also affects the activity of other muscles like tongue, jaw and lips, which shape the resonant cavities and alter speech production [7].

Olaf Lippold's mid-20th century discovery of the 8-12 Hz range physiological tremor in human muscles led to additional research concerning the relationship between psychological stress and the human voice, for the purpose of developing a technology capable of accurately detecting vocal stress levels [6], [12].

The first commercially available VSA system was developed through experimentation by Allan D. Bell, Jr., who discerned which voice characteristics were most likely to show stressed responses. Bell's early studies focused on Frequency-Modulated infrasonic modulations ($< 20\text{Hz}$), which are below the level of human audibility. According to Bell, the unstressed muscle allows a greater variation in the Frequency-Modulated intonation, which becomes flatter as stress increases. This flattening effect could be graphically displayed as VSA output. In fact, VSA output charts show that the normal unstressed voice started with a gradual buildup from initial low energy to full force. Conversely, the stressed utterance usually started with an initial burst of energy and diminished without displaying the Frequency Modulation that characterizes the unstressed pattern. Thus, the stressed utterance resulted in a much flatter line in the graphic output. Based on his findings, Bell produced a VSA device that could detect, measure, and graph the infrasonic wave forms produced by the human voice [1 - 2].

In theory and practice, VSA is designed to identify the phases in speech where the voice displays discernible signs of being under constraining influence. Once the affected utterances are isolated, trained VSA examiners investigate the source for such stress, and question the subject (i.e. the speaker) with a goal of establishing the truth concerning a specific matter. Thus, VSA is categorized as a truth verification technology.

VSA examinations are conducted using established questioning protocols to determine the stress or lack thereof in the human voice. Stress, or the lack thereof, can be identified by a trained VSA examiner to assist in determining truthfulness or deception of the examinee's responses to direct questions. This is accomplished by analyzing and quantifying the characteristic shapes of the voice graphs (e.g., amplitude, cyclic changes, leading edge slopes, and square waveform shapes or blocking) produced by the examinee.

Critics of VSA have debated this technology's accuracy and dependence upon output in coding data is reflective of the algorithms used and the effectiveness of the examiners. Some researchers have claimed that vocal changes cannot be detected as a result of stress, while others have asserted that VSA and its competitors are insensitive to stress and deception, both in the laboratory and field [8].

Advocates of VSA understand its limitations, but they also recognize its promise, as the technology has improved considerably over time. VSA mathematical models are continually being developed and optimized. For instance, Adaptive Empirical Mode Decomposition (AEMD) differentiates between low to medium stress levels in the human voice by decomposing nonlinear, non-stationary signals into the sum of a series of stationary signals, which allows specific fluctuations in frequency and amplitude to be detected in real-time [18].

Additionally, proponents state that even with the use of well-established "staple" algorithms (e.g., Fast Fourier Transform; the McQuiston-Ford Algorithm) VSA is an effective technology for the investigation and detection of human stress associated with deception [9]. As a result of the McQuiston-Ford Algorithm used in several modern VSA systems, the recorded changes of the human voice can be converted into easy-to-interpret voice patterns (i.e., graphical displays), which can be

analyzed and quantified by trained VSA examiners. Further, today, such analyses can be accomplished automatically, by allocating percentages of stress for each voice pattern using standardized scoring processes [16 -17].

Gaining valid and verifiable information has long been a challenge for criminal investigators striving to separate the guilty from the innocent. Many stress-detection technologies have proven to be cumbersome and time-consuming, culminating in questionable results [14]. On the other hand, technology-free investigative interviews and interrogations conducted by police have generally not attained confession rates exceeding 50% [11]. To date, researchers have overlooked a valuable benefit of VSA technology: in the hands of skilled professionals, VSA processes can support investigative assessments, which dramatically increase the rate of valid and legally acceptable confessions and admissions from suspects and other persons of interest to the criminal justice system.

The goal of this retrospective study was neither to disprove nor discredit older stress and deception detection technologies currently in use. Rather, analyses of the cases, conducted over an 18-year period, aimed to test the hypotheses relevant only to this particular technology: during criminal justice investigations, VSA can serve as a reliable decision support tool to help discriminate between deception and no deception; stress and confession rates are interdependent; and the level of jeopardy associated with specific crimes can affect the confession rates obtained from guilty individuals under investigation.

2. Method

2.1 Case and Subject Representation

The original group of total case subjects ($n > 3,000$) tested over an 18-year period was culled for those that could be retrospectively studied, such that they met the following requirements: a confession had been a potential outcome (i.e., a crime had been committed in which the individual was implicated); there was no involvement with non-criminal statement veracity testing; no employment

clearance was involved; the case was not used as confirmation of witness testimony; and controlled testing had occurred (i.e., responses could be verified by the VSA process by means of structured re-questioning).

Following the excluded group, the cases that remained were (n=2,109). After these cases were numbered in consecutive order, the numbers were separated and pooled. The concealed, individual numbers were then randomly selected in single-blind fashion, before being disclosed to the primary researcher for analysis and review. From this final set of cases (n=236), there were (n=329) possible confession outcomes. Not included in the confession rate were those confessions in which suspects admitted their guilt to a wrongdoing other than the crime(s) specifically addressed during the examination.

The subjects (n=279) within this study ranged in age, from 5 to 74, 84% (n=234) were male, and 16% (n=45) were female. Their representation included criminals, defendants, suspects, persons of interest, and court-ordered mandates (e.g., child protective situations), in total n=259, and alleged victims n=20. Within the former group, organized/contract criminals were also included (n=6). A wide spectrum of people was examined from those with no criminal history, to those with previous arrest and/or conviction records, as well as professional criminals; wealthy individuals; well-educated professionals; public officials; indigents; and those found to be below normal intelligence. The number of crimes represented per case ranged from (n=1-3).

Among the different crime types (n=29) in this study: murder 18.2% (n=60), rape 15.8% (n=52), grand larceny 14.9% (n=49), burglary 9.1% (n=30), sexual abuse 8.8% (n=29), larceny 4.6% (n=15), arson 5.8% (n=19), assault 4.9% (n=16), and robbery 3.3% (n=11) were the crimes mostly heavily represented. The crimes that were moderately represented included sodomy 1.5% (n=5), child abuse 1.5% (n=5), armed robbery 1.5% (n=5), misconduct 1.2% (n=4), criminal mischief 0.9% (n=3), weapons violations 0.9% (n=3), narcotics 0.9% (n=3), fraud 0.9% (n=3), indecent assault 0.9% (n=3),

bomb threats 0.6% (n=2), sexual contact 0.6% (n=2), and kidnapping 0.6% (n=2). The crimes that were of low representation (n=1) included manslaughter, coercion, attempted murder, attempted rape, missing person, felony DWI, buying testimony, and perjury.

2.2 Interview Formatting and Modus Operandi

Ninety-one percent (91%) of the cases under study represented criminal investigations in which authorities had reached an impasse. In each case, the procedure used by the VSA examiner consisted of the following steps: receiving a briefing from the requesting agency, interview of the subject, questioning, re-questioning, final evaluation by VSA, and post-examination interview if required.

Each subject within the Confession Possibility List had been individually interviewed by the VSA examiner, who had two goals in mind: to exonerate the innocent/identify the guilty and to obtain legally valid and independently verifiable confessions from those individuals who were unable to clear the VSA process. Each interview had been conducted according to a standard protocol in which the wording of the interview, but not the method, was adapted on-site to each specific case. This procedure consisted of six steps, which are outlined in Table 1.

If a confession was made by the subject, the examiner asked the subject to further support his/her confession by verifying specific details of the events under investigation or by providing additional details concerning the events under investigation. False confessions are by no means unknown in law enforcement and legal circles, and it was imperative that the confessions be independently verified and validated [5]. This was accomplished by asking the subject to confirm evidence which had not been made public, and to provide a narration of the event. Any newly obtained information or case specific facts provided during a confession would be checked closely against all available evidence. Additionally, if a confession occurred, a written statement was also taken from the subject. A subsequent VSA examination was then conducted to validate the veracity of the written statement. At the conclusion of the VSA examination process, all findings and work product were turned over to the requesting agency for their use as appropriate.

Table1: Six Steps of the Standard Procedure used for Interviews

Step	Process
1.	VSA examiner briefed by requesting authority
2.	Pretest interview with subject conducted (audio recorder used)
3.	Initial VSA questions asked (9-31 questions, yes/no answers)
4.	Processing of answers with VSA and discernment of stress patterns
5.	Retest, as required, using reformulated questions for those issues where stress was observed until no stress was observed or stress could not be eliminated
6.	Outcome (A): "No Stress Indicated" Conclusion = cleared subject
	Outcome (B): "Stress Indicated" Conclusion = post-exam interview of subject to determine reason for stress

NOTE: The only variability was the wording which was adapted to each case

2.3 Vocal Stress Detection System

The two commercially available VSA systems used for the cases under study employed proprietary versions of the McQuiston-Ford VSA Algorithm, which had been found to be accurate in previous research [13], [16]. These systems detect involuntary and inaudible frequency modulations in the 8-14 Hz range. By use of proprietary signal filtering and discrimination techniques, the systems display the results as VSA graphs.

3. Results

3.1 Overall Stress and Confession Rates

Each crime category was analyzed for its indicated rates of stress/no stress and confession/no confession. In each of the cases reviewed here (n=236), inclusive of (n=329) confession possibilities, stress was indicated in 92% of the examinations (n=303), leaving 8% of the exams with a no-stress result (n=26). Confessions were obtained from 89% of the interviewees (n=292), leaving an overall 11% no-confession rate (n=37). Most notably, among all interviews conducted, where stress was indicated, 96.4% resulted in suspects making self-incriminating confessions (Table 2).

Table 2: Breakdown of 329 Interview Rates of Stress and Confession

	Stress Indicated			No Stress Indicated			Confession			No Confession		
	n	Category (%)	Total (%)	n	Category (%)	Total (%)	n	Category (%)	Total (%)	n	Category (%)	Total (%)
Murder	56	93.3	17.0	4	6.7	1.2	48	80.0	14.6	12	20.0	3.6
Rape	52	100.0	15.8	0	0.0	0.0	51	98.1	15.5	1	1.9	0.3
Grand Larceny	30	61.2	9.1	19	38.8	5.8	30	61.2	9.1	19	38.8	5.8
Burglary	30	100.0	9.1	0	0.0	0.0	30	100.0	9.1	0	0.0	0.0
Sexual Abuse	28	96.6	8.5	1	3.4	0.3	28	96.6	8.5	1	3.4	0.3
Larceny	15	100.0	4.6	0	0.0	0.0	15	100.0	4.6	0	0.0	0.0
Arson	19	100.0	5.8	0	0.0	0.0	18	94.7	5.5	1	5.3	0.3
Assault	16	100.0	4.9	0	0.0	0.0	16	100.0	4.9	0	0.0	0.0
Robbery	10	90.9	3.0	1	0.3	0.3	10	90.9	3.0	1	9.1	0.3
Sodomy	5	100.0	1.5	0	0.0	0.0	5	100.0	1.5	0	0.0	0.0
Child Abuse	5	100.0	1.5	0	0.0	0.0	5	100.0	1.5	0	0.0	0.0
Armed Robbery	5	100.0	1.5	0	0.0	0.0	5	100.0	1.5	0	0.0	0.0
Misconduct	4	100.0	1.2	0	0.0	0.0	4	100.0	1.2	0	0.0	0.0
Criminal Mischief	3	100.0	0.9	0	0.0	0.0	3	100.0	0.9	0	0.0	0.0
Weapons	3	100.0	0.9	0	0.0	0.0	3	100.0	0.9	0	0.0	0.0
Narcotics	3	100.0	0.9	0	0.0	0.0	3	100.0	0.9	0	0.0	0.0
Fraud	3	100.0	0.9	0	0.0	0.0	3	100.0	0.9	0	0.0	0.0

Indecent Assault	3	100.0	0.9	0	0.0	0.0	3	100.0	0.9	0	0.0	0.0
Bomb Threats	2	100.0	0.6	0	0.0	0.0	2	100.0	0.6	0	0.0	0.0
Sexual Contact	2	100.0	0.6	0	0.0	0.0	2	100.0	0.6	0	0.0	0.0
Kidnapping	2	100.0	0.6	0	0.0	0.0	1	50.0	0.3	1	50.0	0.3
Manslaughter	1	100.0	0.3	0	0.0	0.0	1	100.0	0.3	0	0.0	0.0
Coercion	1	100.0	0.3	0	0.0	0.0	1	100.0	0.3	0	0.0	0.0
Attempted murder	1	100.0	0.3	0	0.0	0.0	1	100.0	0.3	0	0.0	0.0
Attempted Rape	1	100.0	0.3	0	0.0	0.0	1	100.0	0.3	0	0.0	0.0
Missing Person	0	0.0	0.0	1	0.3	0.3	0	0.0	0.0	1	100.0	0.3
Felony DWI	1	100.0	0.3	0	0.0	0.0	1	100.0	0.3	0	0.0	0.0
Buying Testimony	1	100.0	0.3	0	0.0	0.0	1	100.0	0.3	0	0.0	0.0
Perjury	1	100.0	0.3	0	0.0	0.0	1	100.0	0.3	0	0.0	0.0
TOTAL	303			26			292			37		
% of total	92			8			88.8			11		

NOTE: Confessions Obtained when Stress Indicated = $292/303 = 96.4\%$

3.2 The Link between Stress and Confession in Crime Categories

To determine the one-tailed probabilities of this study's hypo-geometric distributions between stress/no stress and confession/no confession rates, the Fisher's Exact Test was carried out within each crime category and among pooled data. The analysis revealed significant deviations from the null hypothesis in the crime categories of murder ($p=0.001$, FET), grand larceny ($p=0.0001$, FET), sexual abuse ($p=0.0345$, FET), and for pooled data in other crime categories ($p=0.0001$, FET).

Within the crime category of grand larceny, one particular case involved $n=20$ suspects. Of the latter, $n=19$ were cleared by VSA testing (i.e., no stress indicated), whereas $n=1$ resulted in a stress indicated determination. A confession was obtained from the one subject who displayed stress. The Binomial Probability of having 20 successful evaluations in this case alone was found to be: $b(x; n, P) = 9.537e^{-7} (20; 20, 0.5)$, with the mean of the distribution $\mu_x=10$, the variance $\sigma_x^2=5$ and the standard deviation $\sigma_x=2.236$.

Therefore, among the categories of murder, grand larceny, and sexual abuse, and for the study as a whole, the results revealed the probability was significantly superior to chance, and the variables were interdependent.

3.3 Accuracy and Efficacy of the VSA Test in the Field

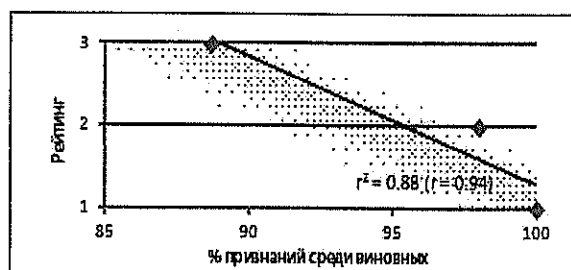
As a decision support tool, based on the data extracted ($n=329$) from this field study, the accuracy and efficacy of the VSA were evaluated. Calculations were based on: Prior Odds (11.048), Likelihood Ratio (27.027), Posterior Odds (298.6), and Posterior Probability (0.9967). The results revealed that a population was tested where 91.7% ($n=302$) of the participants were deceptive. Of those tested who were deceptive, 100% had a positive result. When a positive result was obtained, there was a $PPV = 99.67\%$ chance that the participant was deceptive, leaving a 0.33% chance of a false positive result. When a negative result was obtained, there was a $NPV = 100\%$ chance that the participant was not deceptive, leaving no chance of a false negative result.

3.4 Correlating Confessions of the Guilty With Consequences of Crime

Confessions among the guilty were grouped in one of three categories, according to the severity of typical sentencing for the crime committed (Table 3). The number of guilty found for each crime was pooled according to rating category, such that the total for each category was as follows: n=53 (Rating 3), n=62 (Rating 2) and n=64 (Rating 1). The number of confessions that ensued in each crime category was also pooled, such that the number (and % among guilty) in each category was as follows: n=47 (88.68%) in Rating 3, n= 61 (98.4%) in Rating 2, and n=64 (100%) in Rating 1. When correlating crime consequence ratings with percent of confessions among the guilty, the Pearson's Coefficient was found to be $r = -0.94$ ($r^2 = 0.88$), indicating a very strong, indirect relationship (Table 3). Only categories were considered and analyzed where the sourcing guidelines were well-

Table 3: Confessions of Guilty Correlated with Crime Consequences

Typical Sentence	Severity	Rating	Guilty "n"	Confession "n" (%)	Crime Types
20 years to life	high	3	53	47 (88.68%)	murder
5-20 years	medium	2	62	61 (98.4%)	kidnapping, sex abuse, arson, manslaughter, weapon, robbery
< 5 years	low	1	64	64 (100.0%)	burglary, assault, fraud, larceny



NOTE: All categories in this particular analysis excluded alleged victims and contract criminals (see Results section). Crime Consequences (average sentencing) were extracted from reputable federal sourcing guidelines [3, 4, 15].

documented and regulated [3, 4, 15]. Contract criminals were excluded from this particular analysis, as this special type of offender is known to reject confessions, due to organized crime affiliations, etc., regardless of what their VSA results or the evidence indicate.

4. Discussion of Results

This study's confession rate of 96.4% (when stress was indicated), is laudable in being much greater than the confession rates (50% or less), typically obtained as a result of traditional interview and interrogation procedures, and also notably exceeds the results achieved by other widely available truth verification technologies which, according to the US National Academy of Sciences, are prone to high false positive rates and significant inconclusive results [10, 14].

The 100% sensitivity and 96.3% specificity rates of this study imply that the VSA process can precisely and accurately discriminate stress from no stress in real life crime situations involving consequence and jeopardy, thus enabling the exoneration of the innocent. For 100% of the VSA examinations which resulted in No Stress Indicated (n=26, 7.9% of total examination pool), the individuals represented were exonerated from any wrongdoing based upon confessions obtained from other suspects, evidence developed after the VSA examination, or acquittals at trials. Also, the accurate rates of successful evaluations defied chance probabilities. As a key example, in the Grand Larceny case with 20 suspects, 19 of the examinations resulted in No Stress Indicated, and only one resulted in Stress Indicated – which in turn resulted in a confession. The Bernoulli Probability of having had 20 successful evaluations out of 20 examinations was less than 1 in 1,000,000. If VSA were simply a prop to obtain confessions, it would have been virtually impossible to achieve such specific and unerring results.

Interestingly, a relevant portion of this retrospective analysis implies that there appears to be a strong, indirect relationship between crime consequence/jeopardy and confession rates. The correlation found ($r^2 = 0.88$, $r = -.94$) implies that guilty examinees were less likely to confess when the penal

ramifications (i.e., typical prison sentence) for the crime committed became more severe. This finding further demonstrates the efficacy VSA has when used in an experimentally realistic paradigm and underscores the ability of field researchers to discern trends and associations among “real-life” factors.

5. Implications and Conclusions

This retrospective study provides compelling evidence that when VSA is utilized as an investigative decision support tool in accordance with required operating procedures, and standard VSA interviewing techniques are employed, elicited confessions from criminal suspects can strongly be predicted based upon results of their VSA examinations. Further, VSA can be used by trained professionals to support the acquisition of court admissible criminal confessions at a rate superior to other legal interrogation methods currently employed by the criminal justice system. Ultimately, however, human skill is required to make VSA technology perform its most valuable investigative functions, to exonerate the innocent or to elicit valid and verifiable confessions from the guilty in real-world criminal investigations.

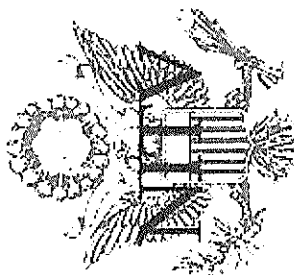
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Summary

The use of Voice Stress Analysis (VSA) technology in Criminal Justice Setting is considered. Practical evidence of the effectiveness of this technology for the investigation of various criminal offenses is provided.



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Evaluating the Research on CVSA

When Ridelhuber and Flood published their policy review, the Department of Defense Polygraph Institute (DoDPI) had been releasing some research questioning the validity of CVSA. However, Ridelhuber and Flood argue that the DoDPI's lab environment did not provide a sufficient model of the real world. Specifically, the lab tests did not provide a situation with truly high stakes, so the subjects knew there would be no real consequences if they lied. As a 1973 study by Gordon H. Barland pointed out, a certain level of stress must be reached before voice changes occur, and the DoDPI's simulated environment failed to meet that standard.

Ridelhuber and Flood also point out that, in order for CVSA technology to be effective, the examiner must go through the standard 6-day instruction process. However, in the DoDPI's studies, the examiner was not properly trained. In fact, the examiner employed the same questioning format used for the polygraph test. Because these examination methods are fundamentally different, the CVSA was, in Ridelhuber and Flood's words, "doomed to fail."

Since these studies were poorly designed and biased against CVSA, Ridelhuber and Flood argue they should be disregarded. Therefore, there is no convincing scientific evidence against the efficacy of CVSA. In contrast, research like the Chapman study demonstrates that the CVSA is highly reliable at detecting deception and obtaining confessions when used in the field.

18-Year Field Study Validates Computer Voice Stress Analyzer as Most Accurate Truth Verification Technology

Independent, peer-reviewed research validates accuracy of the CVSA

LEWES, Del., May 6, 2014 /PRNewswire/ — According to the National Association of Computer Voice Stress Analysis (NACVSA), a recently published research study in the 2012 annual edition of the scientific journal *Criminalistics and Court Expertise* reports the accuracy rate of the Computer Voice Stress Analyzer (CVSA®) is greater than 95%, an assertion long made by the system's manufacturer. The study's results are further bolstered by current US Government funded voice analysis research, which has established voice technologies performed well for border security applications.

The CVSA has been available to law enforcement agencies in the US since 1988, first as an analog device, and since 1997 in a digital version. The CVSA is the only Voice Stress Analyzer in the world with two US Patents and the only system worldwide incorporating the FACT® scoring algorithm, which uses scientifically validated processes to reliably and precisely evaluate the results of CVSA examinations. The CVSA is now used by close to 2,000 law enforcement agencies including major metropolitan agencies such as Atlanta, Nashville, Miami, Baltimore, and New Orleans as well as the U.S. Federal Courts. The California Highway Patrol has used the CVSA for over 15 years and it is now the most widely used truth verification system in the US.

Other advantages of the CVSA are that, unlike the old polygraph, there are no known countermeasures to defeat it and it has no inconclusive results. Additionally, drugs don't affect it and it can be used in virtually any environment.

The 18-year field study was conducted by Professor James L. Chapman and titled "Long-Term Field Evaluation of Voice Stress Analysis In a North American Criminal Justice Setting." Professor Chapman was known as the world's foremost authority on the application of Voice Stress Analysis technologies. Recently deceased, Professor Chapman's career spanned over 40 years as a criminologist, educator and researcher, during which he conducted more than 15,000 Voice Stress Analysis examinations. The study's co-author, Marigo Stathis, a neuroscientist and research analyst, has been the primary or co-author of 27 published scientific articles and studies focusing on various topics related to the human brain and biology.

Professor Chapman used the CVSA to conduct the research and the results achieved were highly consistent throughout the period the study's data were collected. The study's findings revealed the CVSA, when used as an investigative support tool, can accurately predict whether a person under investigation is being truthful or deceptive. The study's findings are supported by scientifically accepted statistical models, and by the 96.4% validated confession rate Professor Chapman attained during the course of the 18-year study. According to current scientific research and meta-analyses, police confession rates worldwide vary between 20-45%, with even the most experienced police interviewers only achieving a 50-55% confession rate. Empirical data collected by the CVSA's manufacturer, US law enforcement and US military CVSA users have long supported such findings; however, this is the first independent and peer-reviewed scientific study to validate these data. Additional studies and research are planned for the future.

For further information on the NACVSA, e-mail: Diana.

Phone: 888-358-5025